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Domain Requirements

Status of this Memo

This memo is a policy statement on the requirements of establishing a new domain in the ARPA-Internet and the DARPA research community. This is an official policy statement of the IAB and the DARPA. Distribution of this memo is unlimited.

Introduction

This memo restates and refines the requirements on establishing a Domain first described in RFC-881 [1]. It adds considerable detail to that discussion, and introduces the limited set of top level domains.

The Purpose of Domains

Domains are administrative entities. The purpose and expected use of domains is to divide the name management required of a central administration and assign it to sub-administrations. There are no geographical, topological, or technological constraints on a domain. The hosts in a domain need not have common hardware or software, nor even common protocols. Most of the requirements and limitations on domains are designed to ensure responsible administration.

The domain system is a tree-structured global name space that has a few top level domains. The top level domains are subdivided into second level domains. The second level domains may be subdivided into third level domains, and so on.

The administration of a domain requires controlling the assignment of names within that domain and providing access to the names and name related information (such as addresses) to users both inside and outside the domain.

General Purpose Domains

While the initial domain name "ARPA" arises from the history of the development of this system and environment, in the future most of the top level names will be very general categories like "government", "education", or "commercial". The motivation is to provide an organization name that is free of undesirable semantics.

After a short period of initial experimentation, all current ARPA-Internet hosts will select some domain other than ARPA for their future use. The use of ARPA as a top level domain will eventually cease.

Initial Set of Top Level Domains

The initial top level domain names are:

Temporary

ARPA = The current ARPA-Internet hosts.

Categories

GOV = Government, any government related domains meeting the second level requirements.

EDU = Education, any education related domains meeting the second level requirements.

COM = Commercial, any commercial related domains meeting the second level requirements.

MIL = Military, any military related domains meeting the second level requirements.

ORG = Organization, any other domains meeting the second level requirements.

Countries

The English two letter code (alpha-2) identifying a country according the the ISO Standard for "Codes for the Representation of Names of Countries" [5].

Multiorganizations

A multiorganization may be a top level domain if it is large, and is composed of other organizations; particularly if the multiorganization can not be easily classified into one of the categories and is international in scope.

Possible Examples of Domains

The following examples are fictions of the authors' creation, any similarity to the real world is coincidental.

The UC Domain

It might be that a large state wide university with, say, nine campuses and several laboratories may want to form a domain. Each campus or major off-campus laboratory might then be a subdomain, and within each subdomain, each department could be further distinguished. This university might be a second level domain in the education category.

One might see domain style names for hosts in this domain like these:

```
LOCUS.CS.LA.UC.EDU
CCN.OAC.LA.UC.EDU
ERNIE.CS.CAL.UC.EDU
A.S1.LLNL.UC.EDU
A.LAND.LANL.UC.EDU
NMM.LBL.CAL.UC.EDU
```

The MIT Domain

Another large university may have many hosts using a variety of machine types, some even using several families of protocols. However, the administrators at this university may see no need for the outside world to be aware of these internal differences. This university might be a second level domain in the education category.

One might see domain style names for hosts in this domain like these:

```
APIARY-1.MIT.EDU
BABY-BLUE.MIT.EDU
CEZANNE.MIT.EDU
DASH.MIT.EDU
```

MULTICS.MIT.EDU
TAC.MIT.EDU
XX.MIT.EDU

The CSNET Domain

There may be a consortium of universities and industry research laboratories called, say, "CSNET". This CSNET is not a network per se, but rather a computer mail exchange using a variety of protocols and network systems. Therefore, CSNET is not a network in the sense of the ARPANET, or an Ethernet, or even the ARPA-Internet, but rather a community. Yet it does, in fact, have the key property needed to form a domain; it has a responsible administration. This consortium might be large enough and might have membership that cuts across the categories in such a way that it qualifies under the "multiorganization rule" to be a top level domain.

One might see domain style names for hosts in this domain like these:

CIC.CSNET
EMORY.CSNET
GATECH.CSNET
HP-LABS.CSNET
SJ.IBM.CSNET
UDEL.CSNET
UWISC.CSNET

General Requirements on a Domain

There are several requirements that must be met to establish a domain. In general, it must be responsibly managed. There must be a responsible person to serve as an authoritative coordinator for domain related questions. There must be a robust domain name lookup service, it must be of at least a minimum size, and the domain must be registered with the central domain administrator (the Network Information Center (NIC) Domain Registrar).

Responsible Person:

An individual must be identified who has authority for the administration of the names within the domain, and who seriously takes on the responsibility for the behavior of the hosts in the domain, plus their interactions with hosts outside the domain. This person must have some technical expertise and the authority within the domain to see that problems are fixed.

If a host in a given domain somehow misbehaves in its interactions with hosts outside the domain (e.g., consistently violates protocols), the responsible person for the domain must be competent and available to receive reports of problems, take action on the reported problems, and follow through to eliminate the problems.

Domain Servers:

A robust and reliable domain server must be provided. One way of meeting this requirement is to provide at least two independent domain servers for the domain. The database can, of course, be the same. The database can be prepared and copied to each domain server. But, the servers should be in separate machines on independent power supplies, et cetera; basically as physically independent as can be. They should have no common point of failure.

Some domains may find that providing a robust domain service can most easily be done by cooperating with another domain where each domain provides an additional server for the other.

In other situations, it may be desirable for a domain to arrange for domain service to be provided by a third party, perhaps on hosts located outside the domain.

One of the difficult problems in operating a domain server is the acquisition and maintenance of the data. In this case, the data are the host names and addresses. In some environments this information changes fairly rapidly and keeping up-to-date data may be difficult. This is one motivation for sub-domains. One may wish to create sub-domains until the rate of change of the data in a sub-domain domain server database is easily managed.

In the technical language of the domain server implementation the data is divided into zones. Domains and zones are not necessarily one-to-one. It may be reasonable for two or more domains to combine their data in a single zone.

The responsible person or an identified technical assistant must understand in detail the procedures for operating a domain server, including the management of master files and zones.

The operation of a domain server should not be taken on lightly. There are some difficult problems in providing an adequate service, primarily the problems in keeping the database up to date, and keeping the service operating.

The concepts and implementation details of the domain server are given in RFC-882 [2] and RFC-883 [3].

Minimum Size:

The domain must be of at least a minimum size. There is no requirement to form a domain because some set of hosts is above the minimum size.

Top level domains must be specially authorized. In general, they will only be authorized for domains expected to have over 500 hosts.

The general guideline for a second level domain is that it have over 50 hosts. This is a very soft "requirement". It makes sense that any major organization, such as a university or corporation, be allowed as a second level domain -- even if it has just a few hosts.

Registration:

Top level domains must be specially authorized and registered with the NIC domain registrar.

The administrator of a level N domain must register with the registrar (or responsible person) of the level N-1 domain. This upper level authority must be satisfied that the requirements are met before authorization for the domain is granted.

The registration procedure involves answering specific questions about the prospective domain. A prototype of what the NIC Domain Registrar may ask for the registration of a second level domain is shown below. These questions may change from time to time. It is the responsibility of domain administrators to keep this information current.

The administrator of a domain is required to make sure that host and sub-domain names within that jurisdiction conform to the standard name conventions and are unique within that domain.

If sub-domains are set up, the administrator may wish to pass along some of his authority and responsibility to a sub-domain administrator. Even if sub-domains are established, the responsible person for the top-level domain is ultimately responsible for the whole tree of sub-domains and hosts.

This does not mean that a domain administrator has to know the

details of all the sub-domains and hosts to the Nth degree, but simply that if a problem occurs he can get it fixed by calling on the administrator of the sub-domain containing the problem.

Top Level Domain Requirements

There are very few top level domains, each of these may have many second level domains.

An initial set of top level names has been identified. Each of these has an administrator and an agent.

The top level domains:

```
ARPA =  The ARPA-Internet   *** TEMPORARY ***

   Administrator:  DARPA
   Agent:          The Network Information Center
   Mailbox:        HOSTMASTER@SRI-NIC.ARPA

GOV  =  Government

   Administrator:  DARPA
   Agent:          The Network Information Center
   Mailbox:        HOSTMASTER@SRI-NIC.ARPA

EDU  =  Education

   Administrator:  DARPA
   Agent:          The Network Information Center
   Mailbox:        HOSTMASTER@SRI-NIC.ARPA

COM  =  Commercial

   Administrator:  DARPA
   Agent:          The Network Information Center
   Mailbox:        HOSTMASTER@SRI-NIC.ARPA

MIL  =  Military

   Administrator:  DDN-PMO
   Agent:          The Network Information Center
   Mailbox:        HOSTMASTER@SRI-NIC.ARPA
```

ORG = Organization

Administrator: DARPA
Agent: The Network Information Center
Mailbox: HOSTMASTER@SRI-NIC.ARPA

Countries

The English two letter code (alpha-2) identifying a country according the the ISO Standard for "Codes for the Representation of Names of Countries" [5].

As yet no country domains have been established. As they are established information about the administrators and agents will be made public, and will be listed in subsequent editions of this memo.

Multiorganizations

A multiorganization may be a top level domain if it is large, and is composed of other organizations; particularly if the multiorganization can not be easily classified into one of the categories and is international in scope.

As yet no multiorganization domains have been established. As they are established information about the administrators and agents will be made public, and will be listed in subsequent editions of this memo.

Note: The NIC is listed as the agent and registrar for all the currently allowed top level domains. If there are other entities that would be more appropriate agents and registrars for some or all of these domains then it would be desirable to reassign the responsibility.

Second Level Domain Requirements

Each top level domain may have many second level domains. Every second level domain must meet the general requirements on a domain specified above, and be registered with a top level domain administrator.

Third through Nth Level Domain Requirements

Each second level domain may have many third level domains, etc. Every third level domain (through Nth level domain) must meet the requirements set by the administrator of the immediately higher level domain. Note that these may be more or less strict than the general requirements. One would expect the minimum size requirements to decrease at each level.

The ARPA Domain

At the time the implementation of the domain concept was begun it was thought that the set of hosts under the administrative authority of DARPA would make up a domain. Thus the initial domain selected was called ARPA. Now it is seen that there is no strong motivation for there to be a top level ARPA domain. The plan is for the current ARPA domain to go out of business as soon as possible. Hosts that are currently members of the ARPA domain should make arrangements to join another domain. It is likely that for experimental purposes there will be a second level domain called ARPA in the ORG domain (i.e., there will probably be an ARPA.ORG domain).

The DDN Hosts

DDN hosts that do not desire to participate in this domain naming system will continue to use the HOSTS.TXT data file maintained by the NIC for name to address translations. This file will be kept up to date for the DDN hosts. However, all DDN hosts will change their names from "host.ARPA" to (for example) "host.DDN.MIL" some time in the future. The schedule for changes required in DDN hosts will be established by the DDN-PMO.

Impact on Hosts

What is a host administrator to do about all this?

For existing hosts already operating in the ARPA-Internet, the best advice is to sit tight for now. Take a few months to consider the options, then select a domain to join. Plan carefully for the impact that changing your host name will have on both your local users and on their remote correspondents.

For a new host, careful thought should be given (as discussed below). Some guidance can be obtained by comparing notes on what other hosts with similar administrative properties have done.

The owner of a host may decide which domain to join, and the

administrator of a domain may decide which hosts to accept into his domain. Thus the owner of a host and a domain administrator must come to an understanding about the host being in the domain. This is the foundation of responsible administration.

For example, a host "XYZ" at MIT might possible be considered as a candidate for becoming any of XYZ.ARPA.ORG, XYZ.CSNET, or XYZ.MIT.EDU.

The owner of host XYZ may choose which domain to join, depending on which domain administrators are willing to have him.

The domain is part of the host name. Thus if USC-ISIA.ARPA changes its domain affiliation to DDN.MIL to become USC-ISIA.DDN.MIL, it has changed its name. This means that any previous references to USC-ISIA.ARPA are now out of date. Such old references may include private host name to address tables, and any recorded information about mailboxes such as mailing lists, the headers of old messages, printed directories, and peoples' memories.

The experience of the DARPA community suggests that changing the name of a host is somewhat painful. It is recommended that careful thought be given to choosing a new name for a host - which includes selecting its place in the domain hierarchy.

The Roles of the Network Information Center

The NIC plays two types of roles in the administration of domains. First, the NIC is the registrar of all top level domains. Second the NIC is the administrator of several top level domains (and the registrar for second level domains in these).

Top Level Domain Registrar

As the registrar for top level domains, the NIC is the contact point for investigating the possibility of establishing a new top level domain.

Top Level Domain Administrator

For the top level domains designated so far, the NIC is the administrator of each of these domains. This means the NIC is responsible for the management of these domains and the registration of the second level domains or hosts (if at the second level) in these domains.

It may be reasonable for the administration of some of these domains to be taken on by other authorities in the future. It is certainly not desired that the NIC be the administrator of all top level domains forever.

Prototypical Questions

To establish a domain, the following information must be provided to the NIC Domain Registrar (HOSTMASTER@SRI-NIC.ARPA):

Note: The key people must have computer mail mailboxes and NIC-Idents. If they do not at present, please remedy the situation at once. A NIC-Ident may be established by contacting NIC@SRI-NIC.ARPA.

1) The name of the top level domain to join.

For example: EDU

2) The name, title, mailing address, phone number, and organization of the administrative head of the organization. This is the contact point for administrative and policy questions about the domain. In the case of a research project, this should be the Principal Investigator. The online mailbox and NIC-Ident of this person should also be included.

For example:

Administrator

Organization	USC/Information Sciences Institute
Name	Keith Uncapher
Title	Executive Director
Mail Address	USC/ISI
	4676 Admiralty Way, Suite 1001
	Marina del Rey, CA. 90292-6695
Phone Number	213-822-1511
Net Mailbox	Uncapher@USC-ISIB.ARPA
NIC-Ident	KU

3) The name, title, mailing address, phone number, and organization of the domain technical contact. The online mailbox and NIC-Ident of the domain technical contact should also be included. This is the contact point for problems with the domain and for updating information about the domain. Also, the domain technical contact may be responsible for hosts in this domain.

For example:

Technical Contact

Organization	USC/Information Sciences Institute
Name	Craig Milo Rogers
Title	Researcher
Mail Address	USC/ISI
	4676 Admiralty Way, Suite 1001
	Marina del Rey, CA. 90292-6695
Phone Number	213-822-1511
Net Mailbox	Rogers@USC-ISIB.ARPA
NIC-Ident	CMR

4) The name, title, mailing address, phone number, and organization of the zone technical contact. The online mailbox and NIC-Ident of the zone technical contact should also be included. This is the contact point for problems with the zone and for updating information about the zone. In many cases the zone technical contact and the domain technical contact will be the same person.

For example:

Technical Contact

Organization	USC/Information Sciences Institute
Name	Craig Milo Rogers
Title	Researcher
Mail Address	USC/ISI
	4676 Admiralty Way, Suite 1001
	Marina del Rey, CA. 90292-6695
Phone Number	213-822-1511
Net Mailbox	Rogers@USC-ISIB.ARPA
NIC-Ident	CMR

5) The name of the domain (up to 12 characters). This is the name that will be used in tables and lists associating the domain and the domain server addresses. [While technically domain names can be quite long (programmers beware), shorter names are easier for people to cope with.]

For example: ALPHA-BETA

6) A description of the servers that provides the domain service for translating name to address for hosts in this domain, and the date they will be operational.

A good way to answer this question is to say "Our server is supplied by person or company X and does whatever their standard issue server does".

For example: Our server is a copy of the server operated by the NIC, and will be installed and made operational on 1-November-84.

7) A description of the server machines, including:

(a) hardware and software (using keywords from the Assigned Numbers)

(b) addresses (what host on what net for each connected net)

For example:

(a) hardware and software

VAX-11/750	and	UNIX,	or
IBM-PC	and	MS-DOS,	or
DEC-1090	and	TOPS-20	

(b) address

10.9.0.193 on ARPANET

8) An estimate of the number of hosts that will be in the domain.

(a) initially,
(b) within one year,
(c) two years, and
(d) five years.

For example:

(a) initially	=	50
(b) one year	=	100
(c) two years	=	200
(d) five years	=	500

Acknowledgment

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References

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